

APPLICATION

of

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on

LIGHTING FIXTURE FRAME AND MOUNTING PANEL APPARATUS

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## LIGHTING FIXTURE FRAME AND MOUNTING PANEL APPARATUS

### BACKGROUND OF THE INVENTION

#### Field of the Invention:

The present invention relates to lighting fixtures, and more particularly, to lighting  
5 fixtures employed in recreational vehicles with direct current wiring.

#### Description of Related Art:

Direct current, fluorescent light fixtures have become popular for use in various  
vehicles such as recreational vehicles, boats and long haul truck cabs. Fixtures of this  
10 type, along with many other varieties of lighting fixtures that may also be suitable for use  
in indoor, outdoor, commercial, industrial or residential applications, typically  
incorporate a frame having a border thereabout for overlying the marginal edges of an  
opening. Such openings are generally configured to receive a light panel that typically  
mounts at least one florescent light tube or any other desired illuminating means.

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Cost effective assembly of such fixtures is of great importance. Given the high  
cost of labor, many different arrangements have been proposed to relieve labor intensive  
steps. One such arrangement includes a light panel received in a recessed opening  
defined by a frame to be loosely secured thereto during the manufacturing and assembly  
20 process for final assembly at the installation site. An arrangement of this type is shown  
in my U.S. Patent No. 6,367,955, which is assigned to the assignee of the instant  
application and discloses a frame having laterally disposed side rails formed with  
inwardly projecting mounting flanges. Retainer clips situated below the frame flanges  
form inwardly opening notches, and a light socket mounting pan is formed with laterally  
25 outwardly turned mounting flanges configured to underlie the frame flanges to be

received in the notches. The retainer clips may then be employed to loosely maintain the pan and frame in an assembled configuration during shipping and storage. Upon installation to a selected structural wall, mounting screws are inserted through both the frame flanges and the pan flanges and then driven into a selected structural wall to mount the device thereto. However, such a device, while enjoying great commercial success, requires the use of a mounting device for final assembly of the pan to the frame at the time of installation.

Thus, there exists a need for a light fixture that is conveniently pre-assembled during the manufacturing process such that its lighting device mounting panel is finally and securely mounted to its frame and such that the fixture may thereafter be readily installed on a selected structural wall or other desired mounting surface. The present invention fulfills this need.

### SUMMARY OF THE INVENTION

Briefly and in general terms, the present invention is directed to a light fixture frame and mounting panel apparatus including a frame formed with a central opening that opens into a panel path for receipt of a panel mounting a lighting device. To assemble the apparatus, the panel is passed upwardly through the opening along the panel path to engage stop pads. A plurality of resiliently deflectable teeth project into such path to be engaged and deflected aside to clear the path so the panel can nest against the stop pads, allowing the teeth to snap back into position to lock the panel in place.

These and other features and advantages of the lighting fixture frame and mounting panel apparatus will become apparent from the following detailed description of preferred embodiments which, taken in conjunction with the accompanying drawings, illustrate by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a bottom perspective view of the lighting fixture frame and mounting panel apparatus embodying the present invention;

5 Fig. 2 is a bottom view, in enlarged scale, of the apparatus shown in Fig. 1;

Fig. 3 is a top plan view, in enlarged scale, of the apparatus shown in Fig. 1;

Fig. 4 is a front view, in enlarged scale, of the apparatus shown in Fig. 1;

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Fig. 5 is a longitudinal sectional view taken along line 5-5 of Fig. 3;

Fig. 6 is a vertical sectional view taken along line 6-6 of Fig. 5;

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Fig. 7 is a longitudinal sectional view taken along line 7-7 of Fig. 3;

Fig. 8 is a transverse sectional view, in enlarged scale, taken along line 8-8 of Fig. 6;

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Fig. 9 is a an enlarged detail view taken from circle 9 of Fig. 7;

Fig. 10 is a bottom view, similar to Fig. 2, but with the lens removed therefrom;

Fig. 11 is a vertical sectional view, in enlarged scale, taken from line 11-11 of Fig.

25 10; and

Fig. 12 is an enlarged, broken perspective sectional view of the apparatus shown in Fig. 1 depicting an exemplary manner in which the mounting panel may be received in the frame.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 Referring to Figs. 1-5 and 10, the lighting fixture frame and mounting panel apparatus of the present invention includes, generally, a horizontal frame 13 formed with a vertical interior wall 16 circumscribing a central opening 15 leading to a vertically oriented panel path 62, and a mounting panel 50 mounting an illuminating bulb or tube which is configured for complemental receipt in the opening 15 to advance along the path  
10 62 to an assembled position. As shown in Figs. 3 and 12, the frame is formed at the top of the vertical wall with a plurality of stop pads 40 projecting inwardly into the path 62. The frame also includes a plurality of upstanding resilient legs 25 formed at their top ends with teeth 27 projecting horizontally into the path to lock the panel 50 against the stop pads 40. The present invention has particular utility for mounting fluorescent light  
15 tubes, and may often be used to create illumination in vehicles having D.C. electrical systems, such as recreational vehicles, motor homes, boats and the like. However, it is also contemplated that the principle features of the invention may be equally well suited for use in wide variety of commercial, industrial, recreational, indoor and even outdoor lighting applications incorporating both A.C. and D.C. electrical systems.

20 The frame 13, as shown in Figs. 3, 4 and 10, may be configured in any convenient or suitable shape, and in a preferred embodiment, is formed with a an interior wall 16, an exterior wall 17, an upper edge 18 and a lower edge 19. As shown in the preferred embodiment of Figs. 5-7, the interior wall 16 is vertically oriented as it extends between  
25 the upper edge 18 of the frame 13 and the lower edge 19 to circumscribe and define the marginal edges of the central opening 15 and the panel path 62.

The frame 13 may be constructed of any convenient material, such as a durable plastic, and may include a plurality of frame segments 14. In the preferred embodiment of Figs. 2 and 3, the frame 13 is shown as including four such frame segments 14 that cooperate to lend a generally square shape to the frame 13. As shown in the preferred embodiment of Figs. 4-7, the exterior wall 17 angles downwardly and inwardly to form a bezel 20, and, in practice, may take on any other aesthetically pleasing or functional contour that the user may desire. Moreover, at least one of the frame segments 14 may include a switch housing 21, as depicted in Figs. 3, 4 and 10, extending through the frame for housing a contact switch 22 connected in circuit with a selected lighting device 55 mounted on the panel. As shown in Fig. 3, the frame 13 is channel shaped to form a hollowed interior 23 to lighten the weight of the frame and reduce the material costs, and this hollowed interior may be segmented into various cavities by vertical webbing or walls.

As shown in Figs. 3, 6 and 12, each frame segment 14 is formed along its length with a pair of reinforcing boxes 41 defined by a pair of end walls 38 and 39 that extend transversely between the upper and lower frame edges, 18 and 19. The boxes 41 are configured on the interior sides thereof, at the upper edge 18 of the vertical wall 16, with respective inwardly projecting horizontal stop pads 40, which are respectively formed with an upper pad surface 42 and a lower pad surface 43. However, it is also contemplated that each frame segment 14 may also be formed with only a single pad 40, or various numbers of the pads 40 may be situated at suitable locations about the interior wall 16. As depicted in the preferred embodiment of Figs. 3 and 12, the upper surfaces 42 of the pads 40 may extend inwardly from the interior wall 16 in a coplanar relationship with the upper edge 18 of the frame 13 so that the upper edge of the frame and the upper surfaces of the pads will be present an even contact surface that will rest flush against a selected wall mounting surface when the apparatus is installed thereon. So configured, the lower surfaces 43 of the pads 40 will face downwardly into the panel

path 62 and will cooperate to form a first horizontal plane spaced below the upper edge 18 of the frame 13 by a distance equal to the thickness of the pads 40. The lower surfaces 43 of the pads 40 will thus act as stops to locate the panel 50 in the desired vertical location within the frame 13 and panel path 62.

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As shown in Fig. 7, 9 and 12, in the preferred embodiment, registration pins 44 project downwardly from the lower pad surfaces 43 to be received in corresponding respective registration bores 61 formed along the edge of the panel 50 to assist in registering and securing the panel to the frame 13 when the top panel side 51 is abutted  
10 against the lower pad surfaces 43 and the teeth 27 are positioned to abut the bottom panel side 52 as set forth below. The bores 61 may extend completely through the panel 50, as shown in Fig. 12, or alternatively may be defined by a depression formed in the top panel side 51 that extends into the depth of the panel but terminates short of the bottom panel side 52.

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With continued focus on the interior wall 16, as shown in Figs. 3 and 12, the resilient upstanding legs 25 extend upwardly from the lower edge 19 of the frame to terminate in the respective teeth 27, which project horizontally inwardly into the panel path 62. In a preferred embodiment depicted in Fig. 3, each frame segment 14 may be  
20 formed with a pair of laterally spaced apart legs 25, with the stop pad or pads 40 being disposed therebetween. However, it is in keeping with the invention to employ any suitable combination of pads 40, legs 25 and teeth 27 dispersed about the interior wall 16 to reliably secure the panel 50 in the frame 13. To lend resiliency to the legs 25, as shown in the preferred embodiment of Figs. 6 and 12, the interior wall 16 may be formed  
25 adjacent to the lateral edges of the respective legs 25 with respective wall openings 24 and 24' that extend from the upper edge 18 of the frame 13 to respective points located slightly above the lower edge 19. However, it is also contemplated that the resiliency may be achieved by a continuous interior wall 16 formed with weakened seams that



define the respective lateral edges of the legs 25, or by any other suitable interior wall 16 construction.

With continued reference to Fig. 12, the teeth 27 are formed on the upper extent of each resilient leg 25 and include respective bottom surfaces 28 and top surfaces 29. The teeth 27 work in conjunction with the stop pads 40 to secure the panel 50 therebetween when it has been advanced upwardly through the central opening 15 of the frame 13 and along the panel path 62 until the top panel side 51 is abutted against the lower surfaces 43 of the stop pads 40. To facilitate this securement, in the preferred embodiment, the bottom surfaces 28 of the teeth 27 are formed with respective cam surfaces 30, which are configured to contact corresponding portions of the marginal edges of the panel 50 as it is advanced upwardly along the path 62. Also, the top surfaces 29 of the teeth 27 are formed with respective upwardly facing support surfaces 31. These support surfaces 31 are generally planar and are collectively disposed in a second horizontal plane, which is spaced apart from and below the first horizontal plane (defined by the lower surfaces 43 of the stop pads 40) by a distance corresponding to a predetermined panel depth 53 formed between the top panel side 51 and the bottom panel side 52 to define a panel slot 47 therebetween configured for securely receiving the panel 50. While in the described preferred embodiment, the teeth 27 are formed at the upper extent of the resilient legs 25, it is also in keeping with the spirit of the invention for the teeth 27 to themselves be formed to project inwardly from the interior vertical wall 16, without associated resilient legs 25. In such an embodiment, the teeth 27 are flexible and constructed with sufficient resiliency to, upon engagement with the panel 50, flex to permit the panel 50 to be advanced past them and then return to their original configuration to be disposed below the panel 50 as described below.

As shown in the preferred embodiment of Fig. 12 having resilient legs 25 and teeth 27, the teeth are configured such that, when the panel 50 is advanced upwardly



through the central opening 15 from the lower edge 19 of the frame 13 and along the panel path 62 toward the upper edge 18 of the frame, corresponding portions of the top panel side 51 in the vicinity of its marginal edges will first engage the respective cam surfaces 30 of the teeth 27 as they project into the panel path 62. Further advancement of the panel over the cam surfaces will cause the free extremities of the resilient legs 25 to flex laterally outwardly from their resting position and then return to this original configuration when the panel 50 has advanced past the cam surfaces 30. In this returned configuration, as shown in Figs. 3, 5 and 10, the support surfaces 31 of the teeth 27 will be abutted against corresponding portions of the bottom panel side 52 in the vicinity of its marginal edges. The panel 50 will also be prevented from further upward advancement along the path 62 as the top panel side 51 is abutted against the lower surfaces 43 of the stop pads 40, as shown in Fig. 3. In this preferred embodiment, the registration pins 44 are also positioned in the registration bores 61 concurrent with the engagement of the cam surfaces 30 with the edges of the panel 50 and with the outward flexing of the legs 25 such that, when the legs flex back into the panel path to engage the support surfaces of the teeth with the bottom panel side 52 and the top panel side 51 is abutted against the stop pads 40, the registration pins 44 will be received in the registration bores 61 to cooperate with the stop pads 40 and teeth 27 in registering and securing the panel 50 in the panel slot 47.

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In a preferred embodiment as shown in Fig. 12, the cam surfaces 30 of the teeth 27 are angled upwardly and inwardly for engaging the generally transversely oriented lateral edges of the panel 50. However, it is also in keeping with the spirit of the invention for the cam surfaces 30 to take on any convenient shape for facilitating the flexing engagement of the legs 25 with the edges of the panel 50, such as for example a rounded contour. It is further contemplated that, in an alternate embodiment, the marginal edges of the panel 50, rather than the teeth 27, may be formed with the cam surfaces 30. In such an embodiment, the bottom surfaces 28 of the teeth 27 are configured for

engagement with the cam surfaces of the panel 50 to cause the legs 25 to flex outwardly and then return to their original configuration as described above. In other alternative embodiments, it is contemplated that the panel 50 may be cut away along portions of its marginal edges to form horizontally outwardly projecting teeth configured for receipt in  
5 corresponding openings defined by spaced apart lips constituting stops formed in the interior vertical wall 16 at a desired mounting location along the panel path 62, or that the panel edges may be formed with horizontally outwardly projecting pins to be received in corresponding stop bores formed along the interior wall.

10 Referring to Figs. 3, 10 and 11, the bottom panel side 52 of the panel 50 is adapted to mount the hardware of a pre-selected lighting device 55, which in the preferred embodiment depicted in Figs. 10 and 11 includes a pair of fluorescent lighting tubes 56 with associated tube support platforms 58 and a wire housing 57. Depending on the manufacturing and assembly requirements, the panel 50 may be pre-assembled and  
15 formed with such a lighting device 55 affixed thereto, or the lighting device may be affixed to the panel after the panel is securely received and registered in the panel slot 47. It is contemplated that the lighting device 55 may take any of a wide variety of forms that are well known in the art, it only being important to the invention that the bottom panel side 52 be adaptable to mount such a lighting device 55 and that the device provide the  
20 requisite illumination desired by the user. As shown in the exemplary depiction of Fig. 11, the hardware of the lighting device 55 may be secured to the panel 50 by hardware connection means 59, which may take on any convenient configuration that is well known in the art for securing such lighting hardware to a mounting panel. The panel 50 may be further formed with a wire passage 54 to permit the necessary wires of the  
25 lighting device 55 to pass from the bottom panel side 52 to the top panel side 51, thereby making such wires available for connection to an external power source in the vicinity of the selected mounting surface of a wall. It is also contemplated that the top panel side 51 may be generally planar, as depicted in Fig. 3, or may be formed with selected mounting

means that may cooperate with the frame 13 in mounting the apparatus to such a selected mounting surface.

To cover and protect the lighting device 55, a lens 35, as shown in Figs. 2 and 4, is  
5 configured to be received in the frame 13. The lens may be selected to permit any  
desired level of light passage therethrough, and is configured on its outer perimeter with a  
plurality of outwardly projecting lens tabs 36 configured for complementary receipt in  
corresponding lens mounting slots 33 formed in the interior wall 16 of the frame 13, as  
depicted in Figs. 6 and 8. In a preferred embodiment, the interior wall 19 of each frame  
10 segment 14 is formed with at least one lens mounting slot 33 for receiving a  
corresponding tab 36 formed to project outwardly from a lateral edge of the lens.  
However, it is also contemplated that each frame segment may be formed with a plurality  
of mounting slots 33 for receiving a corresponding number of tabs 36 formed on the lens  
35, or any other suitable connection means known in the art may be employed to  
15 removably secure the lens in the frame. In a preferred embodiment, the lens 33 is  
formed from a material that is sufficiently resilient to hold its configuration and provide  
protection to the lighting device while also permitting distortion of the lens sufficient to  
dislodge the tabs 36 from the slots 33, thereby removing the lens 35 from the frame 13.

20 When the apparatus embodying the invention is attached to a selected wall  
mounting surface, the frame 13 is designed to be horizontally oriented, as shown in Fig.  
4, with the upper edge 18 abutted against the selected wall mounting surface and the  
lower edge 19 vertically spaced apart from and situated below the upper edge 18.  
Likewise, when the panel 50 is received upwardly into the central opening 15 and  
25 advanced through the panel passage path 62, the top panel side 51 will face upwardly  
towards the selected wall mounting surface and the bottom panel side 52 will face  
downwardly into the path 62. To mount the apparatus to a selected wall mounting  
surface as described above, the frame 13 may be configured with any suitable mounting

means known in the art, and such mounting means may also be formed on the panel top side 51 to function individually or in conjunction with the means formed on the frame to secure the frame to the selected mounting surface. In one preferred embodiment shown in Fig. 10, such mounting means includes hollowed vertical cylindrical barrels 37 formed in the frame 13 in the vicinity of the intersection of adjacent frame segments 14 and defining vertical bores for receipt of respective mounting screws or the like.

In manufacture, the panel and frame may be mass produced separately. The panel itself may be formed and the lighting electronics secured thereto by riveting or other well known fastening means. The panels and frames may then be joined in a production line. In so doing, a panel 50 may be selected from inventory to be secured to the frame 13. Such panel 50 may then be positioned upright in the central opening 15 in the vicinity of the lower edge 19 of the frame and advanced upwardly through the panel passage path 62. The marginal edges of the top panel side 51 will then engage the cam surfaces 30 of the teeth 27, and further upward travel will force the free extremities of the resilient legs 25 to be driven laterally outwardly to allow the edges of the panel 50 to clear such teeth. This will then permit the free extremities of the legs 25 to return to their normal configuration by flexing laterally inwardly, which will cause the top surfaces 29 of the legs to shift underneath the bottom panel side 52 such that the support surfaces 31 of the teeth 27 will be abutted against corresponding portions of the bottom panel side 52 in the vicinity of its marginal edges.

Further upward advancement of the panel 50 along the path 62 will be prevented as corresponding portions of the top panel side 51 encounter the stop pads 40, and the panel 50 will thereby be secured in place in the panel slot 47 with the upper panel side 42 abutted against the lower surfaces 43 of the pads 40 and the bottom panel side 52 abutted against the support surfaces 31 of the teeth 27 of the resilient legs 25. If registration pins 44 are formed on the lower surfaces 43 of pads 40, concurrent with the engagement of the

panel 50 with the cam surfaces 30 of the teeth 27 and the laterally inwardly flexing of the legs 25 to position the support surfaces 31 under the bottom panel side 52, the registration pins 44 will be received the registration bores 61 of the panel 50. So configured, the shear strength of the pins 44 will resist lateral shifting of the panel 50 when adjustments  
5 are made to the lighting device 55 or lighting hardware components are added to the panel, and the pins 44 received in the bores 61 will cooperate with the teeth 27 and stop pads 40 in securely registering and holding the panel in place in the slot 47. Thus, panel 50 may be assembled with the electrical components thereon and may be quickly married with the frame 13 at the time of assembly. So configured, the panel will be held in place  
10 in the frame without the necessity of separate fasteners, and the apparatus may be packaged and shipped without disassociation and disassembly from one another.

From the foregoing, it will be appreciated that the lighting fixture frame and mounting apparatus of the present invention is economical to manufacture, convenient to  
15 assemble and will be received by the user in a configuration ready for immediate installation. While several particular forms of the invention have been illustrated and described, it will also be apparent to those skilled in the art that various modifications can be made without departing from the spirit and scope of the invention. For example, while the lighting device is preferably connected to an external power source, it is contemplated  
20 that it may also be powered by an on-board source such as battery power or the like. Moreover, the mounting means may take any form that is well known in the art, it only being important that it facilitate the secure mounting of the apparatus to a selected mounting surface. Additionally, while the frame has been described as being configured such that the panel is received upwardly into the central opening and panel passage path,  
25 it is also contemplated that the frame, along with its stop pads and resilient legs, may be configured such that the panel is received downwardly in the frame. Accordingly, it is not intended that the present invention be limited except by the following claims.